

ILLINOIS COMMERCE COMMISSION

DOCKET NO. 14-0514

REBUTTAL TESTIMONY

OF

EDWARD GELMANN, M.D.

Submitted on Behalf Of

AMEREN TRANSMISSION COMPANY OF ILLINOIS

March 5, 2015

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I. INTRODUCTION AND WITNESS QUALIFICATIONS

Q. Please state your name, address and present position.

A. My name is Edward Gelmann. My business address is Columbia University, 177
Ft. Washington Avenue, MHB 6N-435, New York, New York, 10032. I am Clyde Wu
Professor of Oncology and Deputy Director of the Herbert Irving Comprehensive Cancer
Center at the Columbia University Medical Center in New York City.

I treat cancer patients, conduct research on the causes and prevention of cancer
and teach medical and graduate students and physicians in training. I have treated cancer
patients and conducted cancer research for over 30 years. I also supervise a cancer
research laboratory at the Irving Cancer Research Center at Columbia where I conduct
research on the molecular and genetic basis for cancer development. In the course of my
research, I have supervised graduate and post-graduate students. I also teach medical and
graduate students, medical oncology fellows, and internal medicine house staff at
Columbia University Medical Center.

Q. Are you licensed to practice medicine?

22 A. Yes, I am licensed to practice medicine in New York, Maryland and the District
23 of Columbia.

24 **Q. Are you a board certified physician?**

25 A. I am board certified in Internal Medicine and in the subspecialty of Medical
26 Oncology.

27 **Q. Please briefly describe your educational background.**

28 A. I received my B.S. from Yale University in 1972 and my M.D. from Stanford
29 University School of Medicine in 1976.

30 **Q. What did you do after graduating from medical school?**

31 A. I was an intern and later a resident at the University of Chicago Hospitals and
32 Clinics. I did fellowship training at the National Cancer Institute in Bethesda, MD. After
33 I finished my residency and fellowship training, I was a research fellow at the National
34 Cancer Institute, and later a Senior Investigator at the National Cancer Institute. I
35 subsequently joined the faculty at Georgetown University Medical School in
36 Washington, D.C. At Georgetown, I conducted cancer research, taught medicine and
37 treated cancer patients for nearly 20 years. In 2006, I accepted my current faculty
38 position at Columbia University.

39 **Q. What is the National Cancer Institute?**

40 A. The National Cancer Institute is part of the National Institutes of Health (NIH),
41 the federal government's primary biomedical research institution. It is the world's largest
42 center involved in cancer research.

43 **Q. What type of research did you conduct at the National Cancer Institute?**

44 A. I conducted cancer research in the National Cancer Institute's Laboratory of
45 Tumor Cell Biology. I investigated the processes by which cells become cancerous. For
46 example, I isolated and characterized several human cancer genes, and I worked with
47 HTLV-I, which is a virus associated with a type of human leukemia.

48 **Q. Did you receive any awards for your work at the National Cancer Institute?**

49 A. Yes, I received a Unit Commendation from the United States Public Health
50 Service for my work in cancer research.

51 **Q. What were your positions and responsibilities at Georgetown University**
52 **Medical School?**

53 A. At Georgetown, I was the William M. Scholl Professor of Medicine and
54 Oncology. I was also the Chief of the Division of Hematology/Oncology, Chief of the
55 Division of Clinical Sciences in the Department of Oncology, Director of the Clinical
56 Research Management Office at the Lombardi Comprehensive Cancer Center, and
57 Director of the Cancer Center's Growth Regulation of Cancer Program. My professional
58 responsibilities included treating cancer patients, conducting research on the causes and
59 prevention of cancer, and teaching medical and graduate students.

60 **Q. On whose behalf are you submitting this testimony?**

61 A. I am sponsoring rebuttal testimony on behalf of Ameren Transmission Company
62 of Illinois (ATXI).

63 **II. PURPOSE AND SCOPE**

64 **Q. What is the purpose of your rebuttal testimony?**

65 A. The purpose of my testimony is to respond to the direct testimony of three
66 intervenors about the alleged health effects of electromagnetic fields (EMF) produced by
67 the proposed 345-kilovolt (kV) transmission line known as ATXI's Spoon River Project
68 (Project).

69 **Q. Are you testifying on behalf of Columbia University Medical Center or any**
70 **other scientific or medical organization with which you are affiliated?**

71 A. No. I am testifying in my individual capacity as a medical doctor and a scientific
72 researcher. The views expressed in my testimony are not necessarily those of Columbia
73 University or any other scientific or medical organization with which I am affiliated.

74 **III. SUMMARY OF THE HEALTH EFFECTS RESEARCH ON EMF**

75 **Q. Are you familiar with scientific and medical research regarding EMF?**

76 A. Yes. There have been hundreds of laboratory studies conducted on EMF. A
77 number of the early studies examined electric fields, but since then almost all of the
78 scientific inquiry has focused on magnetic fields. My review of this large body of
79 research has focused on the types of studies that are typically considered most important
80 for evaluating whether exposure to power frequency fields can cause or contribute to the
81 development of cancer, which has been the primary issue of interest with regard to EMF.
82 Cancer causation research involves many kinds of experiments that range from the study
83 of individual molecules to the study of whole animals. Two principal types of research
84 that I examined were laboratory studies on the effects of EMF on DNA or chromosomes

in cells and studies of animals exposed to power frequency fields, including longer-term studies in whole animals.

Q. Why did you focus on these two principal types of EMF cancer causation research?

A. Critical to cancer causation is damage to DNA. It is important to understand that permanent change in the DNA is necessary to transform a normal cell into a cancer cell. DNA contains the genetic information that provides a blueprint for all cells and organisms, and determines all of a cell's characteristics. DNA change is essential for a normal cell to become cancerous and cancer will not occur without permanent change to the DNA.

Long-term animal studies have a broader capacity than studies on isolated cells to tell scientists about effects that can contribute to the development of cancer. This is because the animal studies look for effects on the whole, living organism, and take into account the biological complexity of a living animal. Also, in these studies, large populations of laboratory animals can be exposed to different levels of an agent for long periods of time, often through an entire life span and/or more than one generation, and then can be compared to other animals that have not been exposed to the agent of interest. If exposure to EMF could cause effects other than damaging DNA or chromosomes, whole animal studies would reveal whether these effects were sufficient to influence the development of cancer or other health effects in the exposed animals. Also, multigenerational studies address concerns about fertility and reproduction including concerns about miscarriage.

107 I am also aware that a number of epidemiology studies have sought to determine
108 whether there are any apparent statistical associations between EMF and the incidence of
109 disease in human populations. I am not an epidemiologist. However, as a medical
110 doctor, cancer researcher, and geneticist, I am generally familiar with epidemiology
111 studies and examine them in the course of my regular professional activities. My
112 perspective is that the results of epidemiology studies typically must be viewed with
113 caution, as these studies do not involve laboratory experiments, where exposures and
114 outcomes can be controlled, tested, and replicated in a rigorous manner.

115 **Q. In general, what do you conclude from these studies?**

116 A. The results of these studies do not provide a scientific basis to conclude that
117 power frequency EMF cause or contribute to cancer or other adverse health effects.

118 **IV. RESPONSE TO INTERVENORS' CONCERNS REGARDING EMF**

119 **Q. Ms. Kellie Tomlinson refers to a 1997 study by the National Institute of**
120 **Health indicating “a small increased risk of childhood cancer based on**
121 **epidemiological research, but emphasizing the absence of laboratory evidence to**
122 **substantiate the risk.” Does this study indicate that EMFs pose a cancer risk?**

123 A. No. Epidemiology studies often have to rely on estimates of exposure and
124 frequently have serious limitations in terms of being able to control for uncertain
125 variables, and in the case of EMF to determine the actual exposure. As a result of these
126 uncertainties, I find epidemiology studies principally useful to generate hypotheses that
127 then can be tested in laboratory studies on cells and animals. There have been a number
128 of epidemiology studies on EMF and a variety of conditions in adults and children. Some

of the epidemiology studies have reported a possible statistical association between EMF and leukemia in children, but other studies have not found such an association. In 2002, the U.S. National Institute of Environmental Health Sciences (NIEHS), which is one of the U.S. National Institutes of Health, concluded that “[f]or most health outcomes, there is no evidence that EMF exposures have adverse health effects,” that the evidence of an association with leukemia in children is “weak”, and that the reported association “is difficult to interpret in the absence of reproducible laboratory evidence or a scientific explanation that links magnetic fields with childhood leukemia.”

Q. Ms. Janet Shipley testified that she is concerned about a “link” between childhood leukemia and power line EMF. Does the scientific and medical research you discussed above support the notion that there is a causative link between EMF and childhood leukemia?

A. No. In 1999, the U.S. National Institute of Environmental Health Sciences (NIEHS), one of the U.S. National Institutes of Health, completed a \$46 million national research program on EMF, known as the EMF-RAPID Program. At the end of the EMF-RAPID Program, the Director of NIEHS prepared a report to the U.S. Congress on the research conducted under the Program, as well as other research.¹ In this report, the NIEHS Director concluded that “[v]irtually all of the laboratory evidence in animals and humans and most of the mechanistic work done in cells fail to support a causal

¹ National Institute of Environmental Health Sciences, National Institutes of Health. NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields . NIH Publication No. 99-4493. National Institute of Environmental Health Sciences, Research Triangle Park, NC, 1999. Available at <http://www.niehs.nih.gov/health/docs/niehs-report.pdf>

relationship between exposure to ELF-EMF at environmental levels and changes in biological function or disease status.” The NIEHS Director’s Report further emphasized that NIEHS would not include ELF (extremely-low-frequency, i.e. power frequency) EMF on its list of exposures “reasonably anticipated” to cause cancer in humans. The Director stated:

The National Toxicology Program routinely examines environmental exposures to determine the degree to which they constitute a human cancer risk and produces the ‘Report on Carcinogens’ listing agents that are ‘known human carcinogens’ or ‘reasonably anticipated to be human carcinogens.’ It is our opinion that based on evidence to date, ELF-EMF exposure would not be listed in the ‘Report on Carcinogens’ as an agent ‘reasonably anticipated to be a human carcinogen.’ This is based on the limited epidemiological evidence and the findings from the EMF-RAPID Program that did not indicate an effect of ELF-EMF exposure in experimental animals or a mechanistic basis for carcinogenicity.

The research conducted under the EMF-RAPID Program was also reviewed by the U.S. National Academy of Sciences (NAS). In its 1999 report on EMF-RAPID, the NAS noted that:

All of the attempted replications in the EMF-RAPID program have had negative or equivocal results. Because these replications were conducted in an environment of increased concern for field characterization and protocol development, their results are persuasive.

...Nearly all of the animal studies relevant to the EMF-cancer issue had negative results, even at field levels that were orders of magnitude greater than the levels typical of human exposure... The outcomes of the animal experiments completed under EMF-RAPID, like those conducted elsewhere, do not support the hypothesis that MF [magnetic field] exposure is involved in the carcinogenic process.

Given the lack of evidence of a carcinogenic effect from the research conducted under the extensive U.S. national EMF research program, the NAS found that:

[I]n view of the negative outcomes of EMF-RAPID replication studies, it now appears even less likely that MFs [magnetic fields] in the

180 normal domestic or occupational environment produce important health
181 effects, including cancer. ...The results of the EMF-RAPID program do
182 not support the contention that the use of electricity poses a major
183 unrecognized public-health danger.

184 In 2007, the World Health Organization (WHO) issued a detailed evaluation of
185 research on EMF.² With regard to the research on cancer and laboratory animals, the
186 WHO Report concluded that “[o]verall there is no evidence that ELF exposure alone
187 causes tumours [in laboratory animals].” The WHO currently states on its public
188 information website about EMF that “[d]espite extensive research, to date there is no
189 evidence to conclude that exposure to low level electromagnetic fields is harmful to
190 human health.” In 2012, Health Canada, the principal public health agency for Canada,
191 concluded that “the vast majority of scientific research to date does not support a link
192 between ELF magnetic field exposure and human cancers. The scientific evidence is not
193 strong enough to conclude that [EMF] exposures cause health problems for the public.”³

194 **Q. Mr. Randall Moon testified that he was concerned his family and employees**
195 **would be continuously exposed to “electromagnetic radiation” while working on his**
196 **property. Do you consider this to be the basis for a cause for concern?**

197 A. The electromagnetic fields under power lines are not “radiation” and cannot cause
198 effects on an individual that have an impact on health. Working on the ground near
199 transmission lines does not represent a health hazard. In fact, the levels of EMF near

² World Health Organization. Environmental Health Criteria 238. Extremely low frequency fields. World Health Organization, Geneva, Switzerland, 2007. Available at http://www.who.int/peh-emf/research/health_risk_assess/en/index2.html

³ Available at <http://www.hc-sc.gc.ca/ewh-semt/radiation/cons/electri-magnet/index-eng.php>

200 power lines are typically less than the levels generated by household items such as hair
201 dryers or microwave ovens.

202 **Q. Based on your review of scientific and medical research regarding EMF and**
203 **your experience as a medical doctor, do you believe power frequency EMF at the**
204 **levels expected for the Spoon River transmission line cause cancer or other adverse**
205 **health effects?**

206 A. I do not.

207 **V. CONCLUSION**

208 **Q. Does this conclude your rebuttal testimony?**

209 A. Yes, it does.